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DIABLO CANYON INDEPENDENT SAFETY COMMITTEE

Report on

Fact-Finding Meeting at DCPP
on January 31 and February 1, 2023

by

Peter Lam, Member, and Richard D. McWhorter, Consultant
with Consultant Andrew C. Kadak, Supporting

1.0 SUMMARY

The results of the DCISC January 31 and February 1, 2023, Fact-Finding Meeting for the Diablo Canyon Power Plant (DCPP) in Avila Beach, CA are presented. Although the Fact-Finding Team (FFT) was on-site at DCPP, portions of the meeting were held remotely to accommodate Pacific Gas and Electric's (PG&E's) employees working from offsite locations. The subjects addressed and summarized in Section 3 are as follows:

1. California Senate Bill 846 Requirements Regarding Deferred Maintenance
2. Plans for Reviewing and Restarting Capital Projects
3. Meet with Nuclear Regulatory Commission (NRC) Senior Resident Inspector
4. Engineering Department Update
5. Technical Review of New Spent Fuel Storage System
6. Auxiliary Saltwater System
7. Turbine and Generator Systems
8. Cyber Security Update
9. FLEX Program Capabilities During a Seismic Event
10. Plant Tour
11. Plant Health Committee Meeting (Cancelled)
12. Meetings with DCPP Officers
13. Licensee Event Report Review
14. California Senate Bill 846 Requirements Regarding an Updated Seismic Assessment
15. Self-Assessment Program
16. Motor-Operated Valve Program

2.0 INTRODUCTION

This Fact-Finding Meeting for the DCPP was held to evaluate specific safety matters for the DCISC. The objective of the evaluation was to determine if PG&E's performance is appropriate and whether any areas revealed observations, which are important enough to warrant further review, follow-up, or presentation at a public meeting. These safety matters include follow-up and/or continuing review efforts by the Committee, as well as those identified as a result of reviews of various safety-related documents.

Section 4 – Conclusions, highlights the conclusions of the FFT based on items reported in Section 3 - Discussion. These highlights also include the team's suggested follow-up items for the DCISC, such as scheduling future Fact-Finding Meetings on the topic, presentations at future public meetings, and requests for future updates or information from DCPP on specific areas of interest, etc.

Section 5 – Recommendations, presents specific recommendations to PG&E proposed by the FFT. These recommendations will be considered by the DCISC. After review and approval by the DCISC, this Fact-Finding Report, including its recommendations, will be provided to PG&E. The Fact-Finding Report will also appear in the DCISC Annual Report.

3.0 DISCUSSION

3.1 California <u>Senate Bill 846 Requirements Regarding Deferred Maintenance</u>

The DCISC FFT met in-person with Allen Wilson, Director, Projects, for a briefing on PG&E's plans to meet a specific requirement of California Senate Bill 846 (SB846) regarding the requirement for DCPP to "…commission a study by independent consultants to catalog and evaluate any deferred maintenance at [DCPP…]." This was the DCISC's first review of this topic.

Mr. Wilson began by reviewing with the FFT the fact that DCPP uses a formal, procedurally controlled process called the Preventative Maintenance Change Request (PMCR) Program to review any changes to Preventative Maintenance (PM) activities. The PMCR process was used to review, approve, and document any changes made to PM activities given the pending cessation of power operations in 2025. Since 2018, changes were made to PM schedules via the PMCR process based on the reduced need to ensure equipment would operate reliably through 2025. An example of PMs that may not have been needed given the 2025 timeframe was motor cleanings and rewindings. Additionally, Corrective Maintenance (CM) activities were routinely reviewed and scheduled for performance with consideration of whether they were needed to ensure reliability through the 2025 timeframe. An example of corrective maintenance that may not have been needed given the 2025 timeframe was painting of corroded structures. PM and CM activities for safety-related equipment or equipment important to safety were never affected by these reviews and continued to be performed.

The purpose and scope of the current Preventative Maintenance Optimization initiative designated as "PMO++," also referred to as "Equipment Long Range Plan Reviews," by DCPP was then discussed. The PMO++ initiative was previously reviewed by the DCISC in December 2022 (Reference 6.1). The PMO++ initiative uses a large group of individuals (about 30) from various departments (Engineering, Maintenance, Operations, Outage and Planning, Risk Management, etc.) to review all of the PMCRs processed since 2018 to determine what changes to PM activities were now needed to optimize equipment performance and reliability beyond 2025. Additionally, the team was reviewing all uncompleted CM activities from the same timeframe to determine if additional CM activities needed to be performed in light of extending operations through 2030. Together, the updated PM and CM activities would form an updated long-range maintenance plan for DCPP. The PMO++ initiative was planned to be completed by the end of the first quarter of 2023.

Mr. Wilson informed the FFT that after the PMO++ initiative is completed, DCPP plans to obtain the services of an independent entity to review the results of the process. DCPP has begun to search for an appropriate company or university that is both independent of PG&E and has trusted and credible expertise in the area of maintenance planning and risk management. The independent reviewer would be provided with both PM and CM information from before and after the PMO++ initiative along with the methodology used for the PMO++ review process. DCPP desires for the independent review to begin sometime in the second quarter of 2023. The FFT concluded that this approach appeared appropriate to meet the SB846 requirement and would aid in ensuring that maintenance activities continued to be effective in achieving the required equipment reliability through a period of extended operations. The DCISC should review the results of the independent review following its completion.

<u>Conclusions</u>: DCPP plans to meet the SB846 requirement for a study by independent consultants to catalog and evaluate any deferred maintenance at DCPP through obtaining the services of an independent entity to review the results of its PMO++ initiative. The DCISC concluded that this approach appeared appropriate, and the DCISC should review the results of the study following its completion.

<u>Recommendations</u>: None.

3.2 <u>Plans for Reviewing and Restarting Capital Projects</u>

The DCISC Fact-Finding Team met in-person with Allen Wilson, Director, Projects, for an update on DCPP's plans for reviewing and restarting capital projects in light of the possibility of extended operations as directed by SB846. The DCISC last reviewed this topic in December 2022 (Reference 6.1), when it concluded the following:

> *It appears that DCPP is appropriately beginning initiatives to review capital projects and review plant maintenance to support extended operation through 2030.*

Mr. Wilson provided the FFT with an update on plans for reviewing capital projects that would be performed in addition to the PMO++ initiative discussed in Section 3.1. He noted that prior to the consideration of extended operations under SB846, there were only five capital projects approved for 2023 and the process for reviewing and approving those projects was discussed with the DCISC in May 2022 (Reference 6.2). Following the decision to extend operations under SB846, DCPP was now beginning a review of former and possibly new capital projects that would need to be implemented. He noted that there was currently no traditional authorization per se for additional capital expenditures as DCPP did not have any authority for capital projects to support operations beyond 2025 under its current general rate case authorized by the California Public Utilities

Commission. Instead, DCPP was focused on applying for and receiving funds allocated by SB846 to the Department of Water Resources which could be used for plant improvements needed to maintain high plant reliability and nuclear safety through 2030.

As DCPP neared the conclusion of its PMO++ initiative in a few months, Mr. Wilson stated that DCPP would begin a review of the PMO++ results along with lists of previously cancelled capital projects and supply chain issues for repair parts. The focus of those reviews would be to identify improvements that would result in immediate or short-term improvements in reliability. Historically most major capital projects took 18-24 months to design and one or two refueling cycles (18-36 months) to implement. Most such large projects would not be feasible or sufficiently beneficial for completion during the timeframe of a five-year extension of operations. Therefore, it was expected that DCPP would be generating a list of projects that would address spare parts availability or would improve reliability with a short implementation schedule. Examples included possible plans to purchase spare or refurbished large motors and/or improvements that could be implemented no later than refueling outages in the 2026-2027 timeframe. Lastly, he noted that any possible extension of operations beyond five years would appreciably change the number of capital projects that would be worthy of consideration.

The FFT inquired about what would happen to the previously proposed and cancelled project to replace all of the plant's Feedwater Heaters. Mr. Wilson reported that although replacement of all Feedwater Heaters was not feasible within the timeframes discussed above, he believed that some of the feedwater heaters could and would be replaced within those timeframes. Specifically, he believed that two to possibly four trains of the Feedwater Heaters which were the biggest threat to reliability could be replaced within the targeted 2026-2027 timeframe. This would be possible because of the extensive and recent industry experience with manufacturing and replacing similar equipment at other nuclear power plants. The FFT also inquired about the timeframe for completing the reviews of possible capital projects, and Mr. Wilson reported that DCPP desired to complete its list of desired projects with a risk ranking by the end of the first quarter of 2023.

<u>Conclusions</u>: DCPP continues to review capital projects that will be needed to support extended operations through 2030. The DCISC should review the results of this review following its completion.

<u>Recommendations</u>: None.

3.3 <u>Meet with NRC Senior Resident Inspector</u>

The DCISC FFT met in-person with Mahdi Hayes, NRC Senior Resident Inspector, and Joe Mancuso, Acting Resident Inspector, for an update. The DCISC meets regularly with the NRC Resident Inspectors and last met with the Senior Resident Inspector during its December 2022 Fact-Finding Meeting (Reference 6.3), when it concluded the following:

> *The meeting with the NRC Senior Resident Inspector was beneficial, and the DCISC should continue the meetings.*

The items discussed in this meeting included the following:

- Recent Resident Inspection Activities
- Problem Identification and Resolution (PI&R) Inspection Results (Mr. Hayes stated that he believed that the PI&R Inspection findings were isolated and not indicative of any major problems with DCPP's Corrective Action Program.)
- Ongoing Reviews of Corrective and Preventative Maintenance

Conclusions: The meeting with the NRC Senior Resident Inspector was beneficial, and the DCISC should continue the meetings.

Recommendations: None.

3.4 Engineering Department Update

The DCISC FFT met in-person with Ryan West, Director of Engineering Services, to review the current status of the Engineering Department at DCPP. The DCISC last reviewed the Strategic Engineering section of the Engineering Department March 2022 (Reference 6.4), when it concluded the following:

> *DCPP's Strategic Engineering group continued to effectively manage the health of systems important to safety, and the overall health of station systems was good. The Department was working to address performance concerns identified by external organizations.*

Mr. West briefed the FFT on recent changes made in the Engineering Department which were driven primarily by the decision to extend operations beyond 2025. The decision to extend operations was driving a rapid increase in the department's workload to support maintenance planning, projects, license renewal application submission, and license renewal aging management inspections (future). To help manage this increased workload, the department was forming a separate Design and Projects Engineering group that would function similar to DCPP's former Design Engineering group but with an added emphasis on supporting project implementation.

Regarding staffing, Mr. West reported that the number of staff in the Engineering Department had decreased due to the upcoming cessation of operations to a planned number of 103 at the end of 2022. With the recent decision to extend operations, the department was actively hiring additional personnel and the department had obtained the assistance of a former DCPP Engineering Manager with recruiting and hiring. In the last few months, about 26 staff had been added to the department and 5 vacancies were open for a total staffing of about 129. He expected to hire about 12 more engineers and bring staffing authorized for the department to over 140 staff members during 2023. He noted that the actual staffing number could be significantly smaller if a large number of existing staff chose to retire at the end of the Tier 2 Retention Program in the fall of 2023. At this point, DCPP was not having any major issues finding qualified personnel to fill vacant positions, although the area's high cost of living was sometimes an impediment for early and late career engineers. He noted that DCPP's focus was upon finding additional staff who already had related experience and not in hiring entry level engineers. Knowledge transfer was an ongoing challenge as many experienced personnel had left over the past few years and now new personnel were being regularly added to the staff. Regarding engineering training, Mr. West reported that formal training for engineers had remained active even with the previously planned cessation of operations and the Learning Services Department was satisfactorily supporting the influx of new staff.

The FFT reviewed recent Engineering Department performance indicators. The performance improvement dashboard showed all areas as "Green" (Healthy) with stable or positive trends. Mr. West stated that in 2022 the department felt it had improved performance in its focus areas of Equipment Reliability, Industrial Safety, and Human Performance during a year that was full of challenging activities. The biggest future challenges facing the department were knowledge transfer and bench depth for key positions and functions. The FFT found that external organizations (such as the NRC, Quality Verification, the Nuclear Safety Operating Committee, and an Industry Benchmarking group) had all recently reviewed the department's performance without any major concerns. The FFT concluded that department performance was strong but recommends that the DCISC again review staffing and performance in about one year given the ongoing changes in the department.

Conclusions: The performance of DCPP's Engineering Department has recently been strong, and the Department is appropriately moving to expand staffing in light of the recent decision to extend operations. The DCISC should review department staffing and performance again in about one year.

Recommendations: None.

3.5 Technical Review of New Spent Fuel Storage System

The DCISC FFT and DCISC Consultant Andrew C. Kadak met remotely with Michelle Olsofski, DCPP License Renewal Engineer; Prakash Narayanan, Orano TN Chief Technical Officer; Raheel Haroon, Orano TN Director of Design Engineering; and Brian Voss, Orano TN Director of Field Services, to discuss technical questions on the proposed new Spent Fuel Storage System to be procured by DCPP from Orano. The DCISC last reviewed technical information from Orano during its November 2022 Fact-Finding Meeting (Reference 6.5.1), when it concluded the following:

> *Orano, DCPP's proposed vendor for future spent fuel storage services, provided technical information in response to a list of detailed questions from the DCISC. Based on the information provided, a number of the DCISC's questions were satisfactorily addressed, and the system appeared to be adequately designed to assure safety in those areas. The DCISC had additional follow-up questions on other portions of the system and will continue to review those issues with DCPP and Orano in future Fact-Finding Meetings.*

In April 2022, PG&E selected Orano as the new vendor for supplying both equipment and contractor services for the future movement and storage of spent fuel assemblies at DCPP. The contract scope of supply included the procurement of 69 Dry Shielded Canister (DSCs) that would each hold 37 spent fuel assemblies as well as 69 Horizontal Storage Modules (HSMs) to house the DSCs at the current Independent Spent Fuel Storage Installation (ISFSI). Additionally, a new pad will be constructed to hold canisters containing waste classified as Greater than Class C. Since the announcement of Orano's selection, the DCISC began a series of technical reviews of the proposed system to confirm that its design is safe for use at DCPP. The FFT presented Orano with a list of technical questions in advance of this Fact-Finding Meeting, and Orano responded by providing written answers and technical references in advance of the meeting along with verbal discussions during the meeting. The FFT's report on the issues follows, framed as the FFT's Question followed by a summary of Orano's Responses (written and verbal) along with the FFT's Conclusions, issue by issue:

1. <u>Question (follow-up to November 2022 question number 2)</u>: Regarding seismic loads in storage:

    a. What is the status of site-specific evaluations for earthquake effects and when will a final evaluation be available for review?

    b. Are evaluations planned that use any beyond-design-basis seismic loading as input? If so, how are those higher loadings characterized, in terms of either the size of the seismic loadings, or their annual frequency, or both?

    c. What is the effect upon safety for a significant amount (11-23") of sliding of the HSMs during earthquakes?

    <u>Response and Discussion</u>:

    a. Orano reported that the site-specific evaluation is expected to be bounded by the generic evaluation for the storage system as licensed by the NRC. Under 10 CFR 72.48 (similar to 10 CFR 50.59), a site-specific evaluation is performed to confirm that the system can be implemented at DCPP without prior NRC approval. Orano's site-specific evaluation for DCPP was almost complete at the time of the FFT's meeting. However, detailed internal reviews at Orano needed to be fully completed before the evaluation could be considered final and made available for review by the DCISC. This was expected to be completed in late first quarter or early second quarter 2023. Orano cautioned the FFT that some portions of the evaluation could contain security-related and/or proprietary information, and distribution would need to be appropriately controlled.

    b. The seismic input used in the evaluations for earthquake effects is defined in terms of response spectra that bound the response spectra for the site-specific design basis seismic load. The response spectra used as input were obtained by adjusting the zero period accelerations of the generic NRC Regulatory Guide 1.60 spectra, so that the resulting spectral accelerations would bound those of the site-specific response spectra in the entire frequency range of interest. Therefore, the seismic loading used in evaluations exceeded the level of seismic loading intensity of the site-specific design basis. However, this was a deterministic approach, and, as such, characteristics of the seismic loading, such as the annual frequency, were not explicitly defined as a site-specific beyond-design-basis seismic loading.

c. While undergoing sliding, the HSMs maintain their rocking stability and Orano reported that the sliding displacement is shown to be less than the minimum separation distance between HSMs and therefore an impact between HSMs is not a concern. The minimum separation distance between HSMs is defined as twice the calculated maximum sliding displacement of a single HSM. The assumption in the current analysis is that a minimum of three HSMs will be connected together. When more than three are connected, the sliding is expected to be considerably smaller.

<u>Conclusion</u>: The FFT concluded that this question was answered satisfactorily, but the DCISC should review the site-specific seismic evaluation after final reviews and approvals are completed.

2. <u>Question (follow-up to November 2022 question number 5)</u>: Vacuum drying – please provide a summary/generic procedure for vacuum drying which outlines the process and what parameters monitored against established limits (time, pressure, percent moisture, etc.)?

   <u>Response and Discussion</u>: Orano reported that vacuum drying is performed based on the procedure specified in Section 9.1.3 of the Updated Final Safety Analysis Report (UFSAR, Reference 6.5.2, Chapter 9). The criterion for vacuum drying is also specified in Section 3.1.1 of the Technical Specifications (Reference 6.5.3). Sections of the vacuum drying procedure from the UFSAR along with the Technical Specifications were provided to and reviewed by the FFT.

   <u>Conclusion</u>: The FFT concluded that this question was answered satisfactorily.

3. <u>Question (follow-up to November 2022 question number 6)</u>: Damaged fuel assemblies – Please provide a summary of damaged fuel assemblies currently in storage in the Spent Fuel Pools (SFPs) at DCPP which would need to be stored using the Orano system. Will there be any need to use Failed Fuel Containers, and if so, where would they ultimately be stored at DCPP?

   <u>Response and Discussion</u>: This question was deferred by Orano to DCPP. Mr. Garcia provided the FFT with the answer as follows: DCPP's procedures define a damaged fuel assembly as one in which inspections found damage to cladding, grid assemblies, or nozzles, and defines a failed fuel assembly as one in which fuel clad has been breached

such that fission product gasses have been released. Using those definitions, DCPP has the following numbers of damaged and failed fuel assemblies:

Location	Failed Assemblies	Damaged Assemblies
Unit 1 SFP	8	2 (+ 4 potentially damaged)
Unit 2 SFP	5	6

Additionally, the Unit 2 SFP also contained a stand-alone container with another 10 damaged fuel rods that had been split apart to fit into the container.

Based on the above numbers, the FFT ascertained that there could be as many as 25 damaged fuel assemblies that would be stored in DSCs using the previously discussed approach of storing these fuel assemblies in specialized compartments in a DSC which are then further confined by the installation of top and bottom end caps. There would also be one or more specially constructed Failed Fuel Containers that would need to be stored in a DSC. All of these activities would be permissible under the current Orano license. DCPP also noted that the current site-specific license for the Holtec system does not accommodate the storage of damaged or failed fuel.

Conclusion: The FFT concluded that this question was answered satisfactorily.

4. Question (follow-up to November 2022 question number 7): Thermal evaluation – Does Orano have a formal report discussing the differences in measured fuel temperatures versus calculations? If not, please provide a written evaluation how Orano explains the differences and what is being done to reconcile them?

   Response and Discussion: The thermal methodology in the UFSAR to evaluate the DSC and HSM during storage operations was developed based on a series of physical tests and associated comparisons of analytical models performed over many years and was designed to result in conservative temperatures.

   Section 4.9.2 of the UFSAR (Reference 6.5.2, Chapter 4) provides a discussion on benchmarking the use of a Computational Fluid Dynamics (CFD) model employed in evaluating the air flow around the DSC while it is in storage within the HSM. This benchmarking evaluation modeled the thermal test setup of an HSM mockup with flat side and top heat shields with 32 kW heat load. This configuration closely resembles the HSM heat shield configuration. As outlined and reviewed in the discussion in Section 4.9.2.4.1 of the UFSAR, the CFD model over predicts the temperatures over most of the measured locations while also under predicting in certain locations.

   For the heat transfer within the DSC, the thermal methodology also is to assume conservative gaps and ignore any contact between the interlocking plates. With regards to the fuel assembly, it is assumed that the fuel is centered within each compartment and the fuel assembly is modeled using a homogenized effective conductivity. This approach overpredicts the maximum temperatures as evidenced by the recent High Burnup Fuel Demonstration Project. In this project, the licensing application predicted a maximum fuel cladding temperature of 318°C which was significantly higher than the measured temperature of 229°C. After the experiment was completed, various studies have been done to better predict the maximum temperatures. However from Orano's perspective as a designer, no additional actions were planned since the results were conservative in nature.

The FFT also inquired if the NRC had accepted this argument about conservatism in the analysis versus accuracy, and Orano responded that its initial certification analysis was still valid and no additional information had been requested from the NRC. Orano also discussed with the FFT how the results of the demonstration project could be used in the future to change the maximum fuel temperature allowed by the regulations and/or to refine the estimates for the amount of heat that is released from spent fuel over time. Orano indicated that the licensing analysis did not credit any conservatives identified nor was it needed to demonstrate safety for the DSC.

Conclusion: The FFT concluded that this question was answered satisfactorily.

5. Question (follow-up to November 2022 question number 9): Loading of a DSC into an HSM – Please provide a summary/generic procedure showing how proper line up of the DSC prior to insertion into the HSM is assured during the loading process?

   Response and Discussion: Orano described to the FFT the generic HSM loading procedure that would be the basis for a site-specific procedure to be used at Diablo Canyon. The process uses visual targets located on both the Transfer Cask (TC) and the HSM. Surveyors' transits would typically be used to align the TC and the HSM to within 1/16" both horizontally and vertically prior to transferring the DSC from the TC to the HSM. Additionally, hydraulic pressures would be monitored and maintained below a preset limit during DSC loading to help ensure that excessive forces were not required to transfer the DSC to the HSM.

   Conclusion: The FFT concluded that this question was answered satisfactorily.

6. Question (follow-up to November 2022 question number 10): Criticality Control – Please provide additional design information on the fixed neutron absorber plates (material used, operating experience, aging, and inclusion in the Aging Management Plan)?

   Response and Discussion: Section 9.1.7 of the UFSAR (Reference 6.5.2, Chapter 9) describes the fixed neutron absorbers in detail. They are comprised of boron-aluminum material fused together via one of three possible methods. The method used at DCPP will be a boron carbide/aluminum Metal Matrix Composite (MMC). The system that is planned to be employed at DCPP is currently in its initial license period of 20 years. For a future renewal of the system's generic license, Orano reported that a Time Limited Aging Analysis will be employed to demonstrate that neutron absorber will maintain its effectiveness for over 100 years with negligible loss of boron. It is not expected that an Aging Management Plan will be needed for neutron absorbers.

   Conclusion: The FFT concluded that this question was answered satisfactorily.

7. Question (follow-up to November 2022 question number 13): Helium leakage impacts – Please provide additional information about the length of time helium is required to maintain thermal performance and the long-term consequences of the loss of inert environment? Also, please clarify whether or not convective heat transfer (through the helium gas) is required for thermal performance?

   Response and Discussion: Section 5.2.1.2 of the UFSAR (Reference 6.5.2, Chapter 5) states that the gas fill of the DSC interior will be at a pressure that will maintain a non-reactive environment for at least the 80-year storage life of the DSC under normal, off-normal, and accident conditions. In addition, the DSC does not rely on convective heat transfer within the DSC. It relies on conduction and radiation heat transfer modes within the basket assembly to maintain the thermal performance.

   The FFT discussed with Orano the possibility of occurrence of a DSC defect that could allow the helium gas to vent and possibly be replaced with air. Orano emphasized that it focused upon aggressive prevention and repair if needed to prevent the occurrence of any through-wall defects. Currently, the possibility of helium leakage from a cask is considered a beyond design basis issue. Orano noted that if required at the time of license renewal as a part of aging analyses, a calculation could be performed if needed to demonstrate the continued thermal performance of the system using the thermal conductivity of air instead of helium. It should be noted that after 20 years of storage the heat generation in the DSC is significantly reduced, decreasing the internal pressure which would be the driving force for the release of any gases.

   Conclusion: The FFT concluded that this question was answered satisfactorily. The DCISC should continue to follow ongoing industry activities in assessing both the likelihood and the consequences of a spent fuel canister through-wall defect.

8. Question: Update on the status of NRC licensing submittals and reviews? Any areas of particular interest or requests for additional information with the NRC?

   Response and Discussion: For Certificate of Compliance (CoC) 1042 Amendment 3, the NRC is in the process of finalizing the issuance of the Safety Evaluation Report and the rulemaking package. The effective date is projected to be September 2023. (Amendment 3 introduces flexibility in heat load zoning for Boiling Water Reactor fuel assemblies.)

   For CoC-1042 Amendment 4, the NRC is in the process of generating their Request for Supplemental Information which will soon be sent to Orano with a response due by March 31, 2023. The effective date is projected to be September 2024. With the approval of Amendment 3 (which contains similar information on heat load zoning), Orano reported that there should be no challenges in approval for the analogous portion of Amendment 4. (Amendment 4 introduces flexibility in heat load zoning for Pressurized Water Reactor fuel assemblies.)

   Conclusion: The FFT concluded that this question was answered satisfactorily.

9. Question: Lessons Learned from previous loading campaigns – Does Orano have an overall lessons learned report based on their past loading campaigns that can be shared with the DCISC?

   Response and Discussion: Orano captures lessons learned during and after every loading campaign. Since 2011, Orano has been providing fully trained loading staff and related loading services and has accumulated many lessons learned as a result. Operating Experiences have also been presented at the Nuclear Energy Institute Used Fuel Conference over the years. Additionally, the Orano TN Users Group (TNUG) has a website that houses Operating Experience and Lessons Learned not only directly from Orano but also from customers and users. DCPP already has access to the TNUG website. Orano offered that upon approval from the TNUG and Orano leadership, the DSISC could be granted access to the TNUG website as well if needed.

   The FFT asked if there were any continual problem areas, and Orano responded that there were none. Also, the FFT asked if in general there were any significant lessons learned from past activities that would potentially be applicable to DCPP. Orano responded that DCPP was a site with a relatively open layout both in the Spent Fuel Building and the ISFSI. As such, the site-specific procedures and processes were expected to be relatively straightforward.

   It should be noted that should operation of DCPP be extended, additional casks would have to be procured and loaded to maintain the ability to discharge a full core to the Spent Fuel Pool earlier than the currently planned receipt of the new Orano system. According to DCPP, no decision has been made regarding whether Holtec or Orano technology will be procured for an interim loading campaign.

   Conclusion: The FFT concluded that this question was answered satisfactorily.

10. Question: Please provide more details on the size and design basis for the axial retainers which hold the DSC in position within the HSM?

    Response and Discussion: Two axial retainer options are postulated for the HSMs to be used at Diablo Canyon. The first option consists of two axial retainers, one on each of the rails. This option is similar to the design currently in use at the San Onofre Nuclear Generating Station. The second option postulates one axial retainer placed between the rails within an embedment. In both options, the axial retainer is placed into a cavity in the HSM and a stop bolt is adjusted to fit tight against the DSC to ensure it does not have any room to slide along the length of the rails during a seismic event. The axial retainer is designed to withstand all loads imparted by the DSC in a seismic condition. Orano also provided a sketch of the axial retainer and explained its operation in more detail.

    Conclusion: The FFT concluded that this question was answered satisfactorily.

In summary, the FFT received much valuable information from the Orano team and appreciated the work performed by PG&E and Orano in responding to its questions. The DCISC will continue to monitor license amendment progress and work to incorporate the system at DCPP. The DCISC should review the site-specific seismic evaluation after final reviews and approvals are completed and other future technical issues as they arise.

<u>Conclusions</u>: Orano, DCPP's proposed vendor for future spent fuel storage services, provided technical information in response to a list of detailed questions from the DCISC. Based on the information provided, the DCISC's questions were satisfactorily addressed, and the system appeared to be adequately designed to assure safety. The DCISC will continue to monitor license amendment progress and other work to incorporate the system at DCPP. The DCISC should review the site-specific seismic evaluation after final reviews and approvals are completed and other future technical issues as they arise.

<u>Recommendations</u>: None.

3.6 <u>Auxiliary Saltwater System</u>

The DCISC FFT met remotely with Dustin Pratt, Auxiliary Saltwater (ASW) System Engineer, to review the health of the ASW System. The DCISC last reviewed the health of the ASW System in March 2020 (Reference 6.6.1), when it concluded the following:

> *The DCISC found that Auxiliary Saltwater Systems continue to be given close attention by the DCPP staff, and the systems in both Units continue to be rated as "Healthy" with no major issues.*

The ASW System is a safety-related, Design Class 1 System. It provides the heat sink required for the safe shutdown of the plant. The system in each unit provides cooling water from the Pacific Ocean (the Ultimate Heat Sink) to the Component Cooling Water (CCW) heat exchangers, through which CCW is pumped and, in turn, serves to remove heat from various plant systems. In the event of an accident involving a significant loss of reactor coolant, the ASW System is relied upon to function so that the CCW System can cool the Residual Heat Removal and Containment Ventilation systems, which, in turn, cool the nuclear fuel in the reactor and the Containment, respectively. ASW and CCW are also used to cool the Spent Fuel Pool (SFP) Cooling Systems. There are two ASW Pumps for each unit, and each pump can supply sufficient cooling water through both of two redundant trains to either of the two CCW heat exchangers for each unit. In addition, an ASW crosstie exists between Units 1 and 2 so that the standby ASW Pump from one unit can supply ocean water to either CCW heat exchanger of the other unit. This crosstie is modeled in the Probabilistic Risk Assessment evaluation for DCPP.

The ASW Pumps in each unit are electric motor driven 100 percent capacity pumps and are powered from separate vital power 4kV electrical buses. In the case of a loss of offsite power, the pump motors are powered by electricity supplied by DCPP's Emergency Diesel Generators. The pumps are physically located in the Intake Structure. Each pump is located in a separate watertight compartment with drainage to prevent motor damage as a result of flooding. Backflow check valves are located in each compartment drain to prevent flooding in the compartment from external sources. Additionally, snorkels with intakes located at the 45-foot level are installed to maintain compartment ventilation should the intake structure be flooded. One traveling screen filters the seawater for two ASW Pump suction bays. The portable Emergency ASW (EASW) System serves as a major element of the post-Fukushima FLEX strategy. DCPP has four trailer-mounted diesel-driven EASW Pumps, two per unit, which are designed to take suction from the ocean and be tied into the ASW discharge to the plant with portable piping. The portable, built on-site EASW System has been procured and tested satisfactorily.

The System Engineer reviewed the status of the systems with the FFT and provided copies of the System Health Reports for both units. ASW System Health was rated overall as Green (Healthy) for both Units 1 and 2. Each unit was also rated on the following additional individual performance sub-categories: Reliability, Maintenance Rule Compliance, Material/Equipment Condition, Operations Concerns, Performance Monitoring, and Design. All of those performance sub-categories were rated as Green (Healthy) for Unit 1 except for a rating of Red (Unsatisfactory) in the performance sub-category of Reliability. This rating was due to a motor ground that occurred during a pump start in July 2021. All of the initial corrective actions for the event were complete, but the rating would remain Red until all of the follow-up actions for the Root Cause Evaluation (RCE) were fully closed and reviewed by the Corrective Action Review Board. (This event and the RCE were previously reviewed by the DCISC in September 2021, Reference 6.6.2.) Unit 2 was rated as Yellow (Deficient) in the performance sub-category of "Material/Equipment Condition." This Yellow rating was driven by a problem with age-related degradation of the gate covers at the Intake Structure. That degradation did not immediately affect system operation and had been temporarily addressed by the use of epoxy sealants. Mr. Pratt reported that the issue was also present on Unit 1 to a lesser extent. Performing more permanent repairs would be complex due to the need for cofferdams or other equipment to isolate seawater from the area and allow the replacement of the steel embedments and the surrounding concrete. He noted that this work would be a candidate for project funds available to support extended operations.

The FFT noted that missing from the health report was a long-standing issue regarding the impact of high ocean (i.e., Ultimate Heat Sink) temperatures greater than 64 °F that were experienced during the summer and fall of 2014 (with a peak temperature of 68.2 °F being reached on October 15, 2014). Although those high temperatures had not been reached again since 2014, the Technical Specification Basis Limiting Condition for Operations is 70 °F, above which the system design has not been validated and operations would be outside the current licensing basis. Mr. Pratt reported that there had been no change in the status of the issue since the DCISC's last review (Reference 6.6.1). DCPP engineers had developed a Prompt Operability Assessment (POA) covering higher temperatures that could be used if needed during a short-term period of operations with high ocean inlet temperatures. It was anticipated that the POA would be completed if and when it was actually needed to support continued operations. Mr. Pratt reported that previous efforts to engage a vendor to perform a detailed calculation to demonstrate that plant limits could be adjusted to use a higher ocean inlet temperature would be reconsidered for action as a part of reviews on the use of funds available to support extended operations. The DCISC believed that using the available funds to have a vendor update calculations on allowable ocean inlet temperatures would be appropriate given the possibility of extended operations and the challenge of rising ocean water temperatures.

<u>Conclusions</u>: The DCISC found that the Auxiliary Saltwater Systems continue to be given close attention by the DCPP staff, and the systems in both Units continue to be rated as "Healthy" with no major issues. The DCISC believed that using available funds to have a vendor update calculations on allowable ocean inlet temperatures would be appropriate given the possibility of extended operations and the challenge of rising ocean water temperatures.

<u>Recommendations</u>: None.

3.7 <u>Turbine and Generator Systems</u>

The DCISC FFT met in-person with Robert Fiori, Strategic Engineer, for an update on the health of Turbine and Generator Systems. The DCISC last reviewed the health of Turbine and Generator Systems in December 2020 (Reference 6.7.1), when it concluded the following:

> *The DCPP Turbine/Generators have been and are in Green (good) health with the exception of the Unit 2 Generator hydrogen leak. Unit 2 was shut down recently for the second time with this leak and is aggressively investigating the cause. The Unit 2 leak is not directly nuclear-safety-related but is generation-limiting.*

The basic function of the Turbine-Generator is to convert thermal energy initially to mechanical energy and finally to electrical energy. The Turbine-Generator for each unit receives saturated steam from the four Steam Generators through the Main Steam System. Steam is exhausted from the Turbine-Generator to the Main Condenser. For each of the two nuclear units, a single Siemens-Westinghouse BB96 High Pressure (HP) Turbine is coupled to three Alstom ND56R Low Pressure (LP) Turbines into a four-casing, tandem-compound, six-flow exhaust, 1800 rpm unit.

The Westinghouse Generator and a brushless exciter are connected to an extension of the Turbine shaft, also spinning at 1800 rpm. The Generator is internally cooled by hydrogen gas, which in turn is cooled by the Stator Closed Cooling Water System. The cooling water in this system is at lower pressure than the hydrogen to avoid the possibility of water getting into the Generator in case of a leak. During the refueling outage ending March 19, 2019, DCPP replaced the internal stator components of the Unit 2 Generator, including the hydrogen cooling piping. The piping subsequently developed a leak which caused DCPP to shut down the unit for entry, investigation and repair. Repairs were made and the unit returned to service, but other leaks developed, requiring additional shutdowns and repairs. This problem, its subsequent repairs, and the associated Root Cause Evaluation were previously reviewed by the DCISC during multiple Fact-Finding Meetings and Public Meetings, most recently in September 2021 and October 2021 respectively (References 6.7.2 and 6.7.3).

Mr. Fiori reported that both units' LP Turbines were in excellent condition. All six had completed their initial cycle of inspections with few issues identified. The inspections were performed approximately every 100,000 operating hours, or about every 12-13 years. The only unusual inspection item found were some cracked tack welds on stationary blades, which were repaired.

Both units' HP Turbines were now being operated beyond their original design life. Analyses had been completed which demonstrated that this was acceptable through the end of the current operating licenses in 2024 and 2025. The basis for this acceptability was the robustness of the original design plus the fact that evaluations showed that the risks from liberated blades were minimal. As a part of extended operations, Mr. Fiori believed that reblading or replacement of the HP Turbines would be necessary and could be done as early as Refueling Outages 2R24 and 1R25 in 2024 and 2025. The need for possible HP Turbine replacements was currently under review as a part of the PMO++ program discussed in Section 3.1 above.

The FFT inquired about the status of major steam valves supplying the HP and LP Turbines, and Mr. Fiori reported that the valves were in generally good condition. However, planned maintenance on several of the valves had been previously evaluated and found to be unnecessary and cancelled in light of the planned cessation of operations. Now that an extension of operations was possible, there could be an unusually high number of valve refurbishments that would be required during the upcoming Refueling Outages 1R24 and 2R24 in 2023 and 2024.

Regarding the Generators, Mr. Fiori reported that both units' Generators were now in excellent condition with low vibrations. A major inspection for Unit 1's Generator had been deferred for one outage and would now need to be completed to support extended operations. On Unit 2, the previous vibration issues that resulted in hydrogen leaks appeared to be fully resolved. Inspection of the Unit 2 Generator completed in the most recent Refueling Outage 2R23 found no problems and vibrations continued to be low. He also reported that some corrective actions from the Root Cause Evaluation would remain open until the Unit 2 Generator's next major inspection is complete.

Regarding any other maintenance or projects that might be needed to support extended operations, Mr. Fiori reported that the Generator Exciters were in good condition and would likely not need any additional maintenance to support extended operations. However, the voltage regulators on each unit were original equipment and very outdated in technology. He expected that replacement of the voltage regulators to support improved reliability for extended operations would also be reviewed as a part of the PMO++ program.

<u>Conclusions</u>: DCPP's Turbine and Generator Systems were in good overall health. Replacements of both units' High Pressure Turbines and/or Voltage Regulators could be needed to support improved reliability for extended operations.

<u>Recommendations</u>: None.

3.8 <u>Cyber Security Update</u>

At DCPP's request, the DCISC FFT met in-person with Chance Siri, DCPP Cyber Security Program Manager, and Jordan Tyman, Risk and Compliance Manager, for a brief update on DCPP Cyber Security. The DCISC last reviewed Cyber Security in September 2022 (Reference 6.8) when it concluded the following:

The DCPP Cyber Security System and Program appear highly effective in detecting and preventing probes and attacks on plant safety and power-producing systems.

The DCPP Cyber Security Program was developed in full accordance with 10 CFR 73.54, the NRC Cyber Security Rule, and the intent of that rule is to provide a high assurance that digital computer and communications systems and networks associated with power production and nuclear safety systems (defined as Critical Digital Assets) are adequately protected against a cyber attack. The DCPP Cyber Security Program is in compliance with the NRC's Cyber Security Plan and with the Nuclear Energy Institute's guidance document NEI 08-09, "Cyber Security Plan for Nuclear Power Reactors," Revision 6. DCPP achieved full implementation of its Cyber Security Program in December 2017 and has continued reviewing and improving the program. The purpose of the Cyber Security Program is to protect DCPP critical digital assets to both protect the plant and the health and safety of the public from the consequences of a cyber attack.

Messrs. Chance and Siri briefed the FFT regarding protections in place at DCPP to protect critical digital assets from malware brought in from an external source. DCPP's critical digital assets have no direct connections to the internet. All safety systems and controls, power producing systems, and related technical systems are triple-isolated from the outside, such that no probe or attack can enter and disable any functions. The same is true for devices brought into the station, i.e., they are screened and used in isolation mode until cleared for connection to station systems. DCPP also continuously evaluates cyber security controls and the constantly evolving threat environment for new threats to ensure protection remains adequate.

Conclusions: **DCPP's Cyber Security System and Program appear effective in preventing external malware attacks on plant safety and power-producing systems.**

Recommendations: None.

3.9 FLEX Program Capabilities During a Seismic Event

The DCISC FFT met in-person with Bill Conklin, FLEX Program Manager, and Nathan Barber, Supervisor, Risk and Regulatory Initiatives, for an update on the expected availability and performance of FLEX Program equipment during a seismic event. (FLEX is not an acronym but describes a strategy developed by the nuclear industry to provide diverse and flexible coping strategies to address the loss of safety-related systems due to beyond design basis events.) The DCISC last reviewed the FLEX Program in April 2022 (Reference 6.9.1), when it concluded the following:

The DCPP FLEX Program was healthy thanks to tight controls on equipment status, maintenance, testing, and needed corrective actions. All FLEX equipment was in the status of "Operational and In Position."

Prior to the Fukushima accident in 2011, DCPP had portable generators and other equipment to respond to beyond design basis events, under the post-September 11 terrorist event "B.5.b" orders from the NRC. Following the Fukushima accident, the broader FLEX Program was initiated by the industry to procure additional (mostly portable) equipment and components to mitigate various beyond design basis events such as occurred at Fukushima. These events include loss of all station power; loss of the ultimate heat sink; natural events such as earthquakes, tsunamis, and local intense precipitation; and major fires or explosions. FLEX Equipment includes portable diesel-driven pumps and electric generators along with any necessary associated plant connections, piping, cabling, controls, instrumentation, and numerous other items of equipment that could be needed by personnel when implementing FLEX Strategies. FLEX Strategies are pre-planned and validated guidelines for the use of FLEX Equipment in diverse situations to mitigate beyond design basis events.

The FFT asked DCPP to explain how FLEX Strategies were modeled and used in DCPP's Probabilistic Risk Analysis (PRA). Mr. Barber reported that only one FLEX Strategy was included in the plant's current PRA (Reference 6.9.2). That FLEX Strategy provided steps that could be taken inside the plant to tie Direct Current (DC) Busses together in order to extend the life of batteries needed to supply control power to the Turbine-Driven Auxiliary Feedwater Pump for greater than 24 hours during a Loss of All Alternating Current (AC) Power (offsite and onsite) event. This Loss of All AC Power scenario could come from a Turbine Building collapse which damaged multiple AC power sources and which could be caused either by a beyond design basis major fire or by a mid-level seismic event. This FLEX Strategy did not require the movement or use of any external FLEX Equipment for success (defined as a "Phase 1" FLEX Strategy) but focused on guiding operators to complete tasks inside the plant that were above and beyond responses typical to events included in the plant's design basis. This particular FLEX Strategy was chosen for inclusion into the PRA because it provided a high level of reduction in calculated risk and used only actions that could be completed with high confidence in the expected situation and time period.

Mr. Barber added that DCPP was currently considering adding an additional FLEX Strategy into the plant's PRA. The FLEX Strategy that was being considered involved the use of a diesel-driven feedwater pump (the Emergency Auxiliary Feedwater Pump) to pump water from outdoor storage basins to feed the Steam Generators. This particular strategy was being considered because it could potentially reduce the calculated risks due to major fire events. DCPP considered it would be hard to demonstrate that this strategy would be effective following a major seismic event due to uncertainties with regards to the abilities of operators to gain access to the areas necessary to complete the strategy within the time constraints available before the effectiveness of the strategy would be significantly reduced.

Mr. Barber also added that for major earthquakes, the PRA model assesses risk across an extremely broad range of seismic events (up to 6g) which includes events that could result in the complete failure of either or both of the Containment Building or the Auxiliary Building (although fully seismically designed). Typically, the failure of either building results in core damage due to the large amount of important equipment that is affected by the building's failure. Also in the cases of major building failures, it was very difficult to identify any specific scenarios where there was confidence that the plant could use FLEX Strategies to respond to the event and reduce the risk as calculated by the PRA. The FFT noted that although FLEX Strategies may or may not be performed in a timeframe necessary to prevent core damage or a large radiological release (the standard PRA endpoints) depending upon the specific scenario, this does not reduce the value of the FLEX Strategies as they could still possibly be used to reduce the magnitude of core damage or radiological releases following a beyond design basis accident. In this regard, the PRA may appear to be a conservative analysis.

The FFT also inquired about how human performance is modeled within the PRA for FLEX Strategies and other operator actions. Mr. Barber explained that in general, human performance is modeled based on two factors. The first was cognitive, which evaluated whether or not there was a procedure available to operators along with a trigger to point operators to enter the appropriate procedure. The second was execution, which evaluated the probability of success for an operator performing all of the steps required in the relevant procedure. This represented a long-standing industry approach to modeling human performance based on research and data published by the NRC and typically referred to as the "Swain and Guttmann" methodology (Reference 6.9.3). In the FLEX Strategy discussed above regarding the crosstie of DC Busses, the Emergency Operating Procedure for a Loss of All AC Power event has a specific trigger point to guide operators to "consider the use of FLEX Strategies" to mitigate the event. Additionally, as noted above that particular FLEX Strategy is a Phase 1 FLEX Strategy that does not require the use of any external equipment and can be done in a relatively short time period.

In general, Mr. Barber emphasized that the FLEX Program was designed for flexibility in responding to beyond design-basis events and not for responding to any particular event within any particular timeframe. As such, the industry standards for PRA analyses would typically only allow consideration of the incorporation of Phase 1 FLEX Strategies. While there were many other accident response activities that could be completed using "Phase 2" FLEX Strategies (which use FLEX Equipment stored on site but outside the plant protected area), the uncertainty associated with the timeframes and probabilities of success for the use of such equipment is so high as to be inappropriate for use under the current nuclear industry standards governing the PRA analysis. (There is also a category of "Phase 3" FLEX Strategies which use FLEX Equipment staged at an offsite regional center.) For some very large earthquake scenarios, responses would have to succeed within as little as four hours to have an impact in reducing the risk calculated from the PRA, and Mr. Barber explained DCPP's position that very few Phase 2 FLEX Strategies could be confidently assumed to be completed within that timeframe after a very large earthquake.

The FFT then inquired regarding the specific seismic design criteria used in procuring and storing the FLEX Equipment. Mr. Conklin responded that all of the FLEX Equipment was procured using a minimum requirement of survivability using accelerations based on a design-basis (Hosgri) earthquake plus 25%. Storage methods used in the FLEX Equipment areas were also designed to meet the same criteria, including the design of the structure for the Fire Department Building in which about half of the equipment is stored. He also noted that much of the FLEX Equipment is originally designed for over-the-road transportation use and as such is actually able to withstand much higher accelerations.

<u>Conclusions</u>: The Fact-Finding Team learned that a single FLEX Strategy was currently incorporated into DCPP's Probabilistic Risk Assessment and concluded that this appeared appropriate. The Fact-Finding Team recommends that additional Fact-Finding Meetings be scheduled to cover any remaining DCISC questions or issues raised by this review.

<u>Recommendations</u>: None.

3.10 Plant Tour

The DCISC FFT met in-person with Bill Conklin, FLEX Program Manager, for a tour of FLEX Equipment storage areas. The DCISC last conducted a plant tour during its December 2022 Fact-Finding Meeting (Reference 6.10) when it concluded the following:

> *Radiation levels inside the DCPP Independent Spent Fuel Storage Installation (ISFSI) were found to be extremely low with maximum readings of 2.5 milliRem per hour and essentially no neutrons detected.*

At the request of the FFT, Mr. Conklin guided the team in touring the area inside the Fire Department Building which is one of two locations at DCPP where FLEX Equipment is stored. The FFT found that all observed areas were clean, orderly, and well lighted. All FLEX Equipment appeared to be in good condition and was properly restrained to reduce the likelihood of damage during a seismic event.

FLEX Generators with Tie-downs

FLEX Vehicle with Tie-downs

FLEX Intake Screens with Tie-downs

Conclusions: The DCISC Fact-Finding Team toured the FLEX equipment storage area in the Fire Department Building. All FLEX equipment appeared to be in good condition and was properly restrained to reduce the likelihood of damage during a seismic event.

Recommendations: None.

3.11 Plant Health Committee Meeting (Cancelled)

The DCISC FFT planned to observe the February 1, 2023, meeting of the DCPP Plant Health Committee (PHC). However, shortly before the scheduled start of the PHC meeting, the FFT was informed that the meeting had been cancelled. Mr. Dennis Petersen, Station Senior Director, met in-person with the FFT to explain the reason for the last-minute cancellation. The PHC agenda included only one item related to a communications failure at the station metrological instrument tower (SAPN 51162364). Mr. Petersen stated that the item was placed on the PHC agenda at a time when the investigations and corrective actions were incomplete. Later, the corrective actions were completed, and the issue was closed. He provided a copy of the Notification to the FFT, and the FFT verified that the issue was closed. As the single agenda item was no longer an open issue, the meeting was cancelled to avoid an unnecessary burden on attendees' schedules.

Conclusions: DCPP's plan to conduct Plant Health Committee meeting on February 1, 2023, was cancelled for an appropriate reason.

Recommendations: None

3.12 Meetings with DCPP Officers

The DCISC Member met in-person with Adam Peck, Site Vice President, followed by an in-person meeting with Maureen Zawalick, Vice President, Decommissioning and Technical Services, to discuss items from this fact-finding meeting and other items of mutual interest. The DCISC last met with a DCPP Officer or Director during its December 2022 Fact-Finding Meeting (Reference 6.12), when it concluded the following:

The regular meetings between DCISC and DCPP Officers and Directors continue to be beneficial for both organizations.

Conclusions: The regular meetings between DCISC Members and DCPP Officers and Directors continue to be beneficial for both organizations.

Recommendations: None.

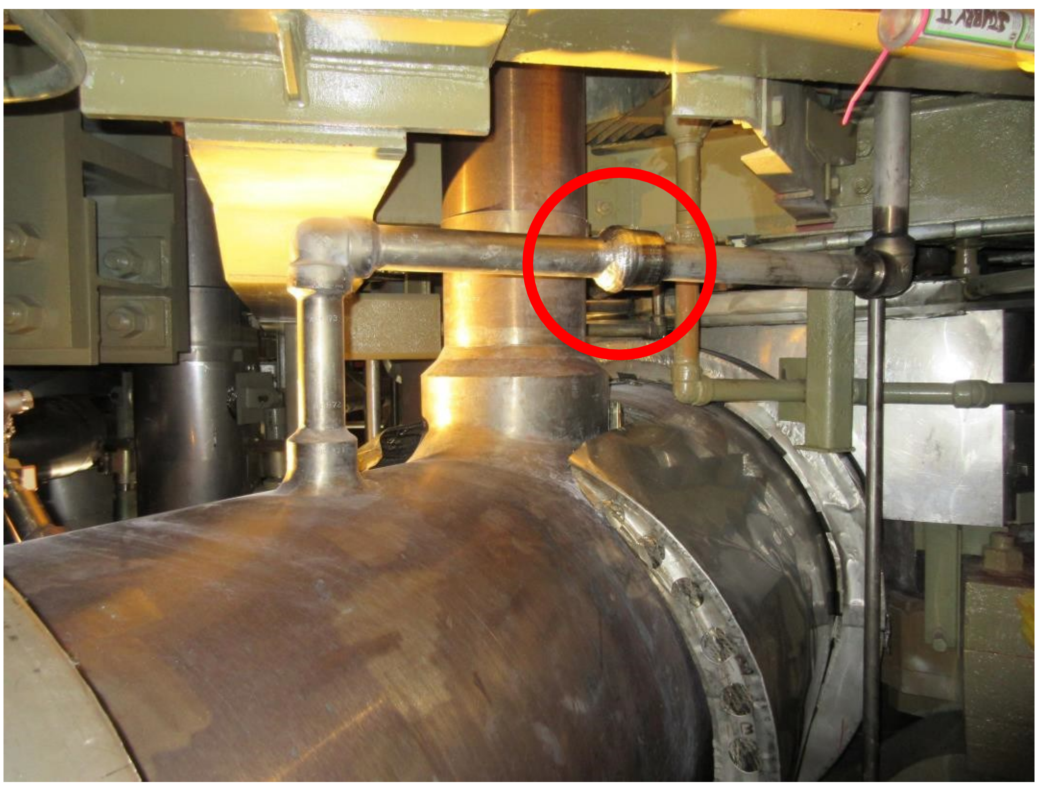
3.13 Licensee Event Report Review

The DCISC FFT met in-person with Kristin Zaitz, Design and Projects Engineering Manager, and Jim Morris, Regulatory Services Manager, for a briefing on the issue that prompted DCPP to submit to the NRC Licensee Event Report (LER) 2022-001 (Reference 6.13.1) on December 21, 2022, regarding Reactor Coolant System (RCS) pressure boundary degradation. This was the first DCISC review of this topic.

Ms. Zaitz provided the FFT with an overview of the issue that resulted in the LER submission. On October 23, 2022, during shutdown for Refueling Outage 2R21, Inservice Inspection Engineers were performing a walkdown of the RCS inspecting for deposits of boric acid residue that could be indicative of small RCS leaks. This walkdown was a periodic maintenance activity performed as a part of the Boric Acid Corrosion Control Program that is regularly reviewed by the DCISC, most recently in April 2021 (Reference 6.13.2). The engineers found a very small amount of white boric acid deposits (no water) on a partially insulated 2” stainless steel line branching off from the Unit 2, Loop 1, RCS Cold Leg, located in the overhead inside Containment on the 91’ level. The 2” line was a branch of RCS piping used to assist with vacuum filling of the RCS when needed following shutdowns and was not used for any operational functions. Scaffolding was erected and insulation removed to inspect the line in more detail. Inspectors found that there was a minute indication (defect) on a 2” socket weld that was not leaking under shutdown conditions but appeared (based on the boric acid deposits) to have allowed a minute amount of water to leak in the past when the RCS was under higher pressures. The amount of leakage was evaluated as minute based upon the fact that it had been undetectable by RCS leakage monitoring calculations which are performed frequently when the plant is at normal operating pressure (2235 psig.) and which are typically able to detect unknown leaks as low as about 0.01 gallons per minute.

After discovery of the leak, DCPP formed an Emerging Issue Team that oversaw additional inspections, repairs, and follow-up activities. The team also obtained the services of an external consulting company with extensive expertise in weld defects and repairs. It was found that the weld was a field weld installed during a modification in 1994. Evaluations concluded that the defect was likely an “arc strike” which can occur when an energized welding rod strikes a metal surface in an uncontrolled manner. The team reviewed the applicable American Society of Mechanical Engineers (ASME) codes and determined that a repair via a structural weld overlay would be appropriate and in compliance with the code. The weld overlay was completed, and the line was returned to service. Vibration monitors were also installed on the line to provide additional vibrational data that could be useful to determining the cause of the leak. DCPP has begun a Root Cause Evaluation (RCE), but the RCE had not been completed as of the date of this Fact-Finding Meeting. Ms. Zaitz noted that the ASME code would allow the weld overlay to be a permanent repair, but that DCPP currently was planning to replace the entire weld during a future Refueling Outage. Pictures of the leak and its location are show in the pictures below:

Reactor Coolant System Leak Location After Cleaning and Before Repairs



Reactor Coolant System Leak Location Following Repairs

The FFT discussed the implications should the leak have become larger during power operations. Mr. Morris and Ms. Zaitz stated that this type of leak would be expected to grow very slowly over time and would likely have been picked up on the RCS leakage monitoring calculations at some point. If the leakage calculations identified leakage over one gallon per minute, the plant would have been required by Technical Specifications to shut down, find the location of the leak, and perform repairs. The FFT inquired what would be the worst-case scenario, and Ms. Zaitz stated that an unlikely complete failure of the 2" socket weld would be well within the plant's design basis accident analyses for a Small Break Loss of Coolant Accident. In that case, normal or emergency equipment could have been used to safely shut down the reactor, replenish water in the RCS, and manage cooldown of the RCS to cold and depressurized shutdown conditions.

The FFT concluded that personnel implementing DCPP's Boric Acid Corrosion Control Program performed well in identifying a minute RCS leak location during routine inspections. DCPP properly responded to the leak's identification with an appropriate repair and was in the process of performing an RCE to define future corrective actions. The DCISC should review the results of the RCE after its completion.

Conclusions: DCPP properly evaluated and responded to evidence of a minute Reactor Coolant System leak discovered while shutdown for Refueling Outage 2R21. Personnel implementing DCPP's Boric Acid Corrosion Control Program performed well in identifying the leak location during routine inspections. The DCISC should review the results of the associated Root Cause Evaluation after its completion.

Recommendations: None.

3.14 California Senate Bill 846 Requirements Regarding an Updated Seismic Assessment

The DCISC FFT met in-person with Tom Jones, Senior Director, Regulatory, Environmental and Repurposing; and remotely with Jeff Bachhuber, Director, Geosciences; Bill Horstman, Principal Civil Engineer; Nozar Jahangir, Manager, Seismic Engineering; and Albert Kottke, Geotechnical Earthquake Engineer, for a briefing on PG&E's plans to meet a specific requirement of California Senate Bill 846 (SB846) regarding the requirement for DCPP to "…conduct an updated seismic assessment." This was the first DCISC review of this specific topic, although the DCISC recently performed a detailed review of DCPP's past seismic evaluations in November 2022 (Reference 6.14.1).

Mr. Bachhuber framed the issue for the FFT by stating that DCPP was still in the process of working with the Department of Water Resources (DWR) to define the path forward to meet the SB846 requirement for an updated seismic assessment. At this point, DCPP was proposing the following steps be taken to meet the requirement:

1. Prepare a detailed plan and discuss with DWR (targeted for completion in first quarter 2023).

2. Perform a review to compile existing data from past seismic models and inputs. This data review would incorporate past seismic studies, NRC submittals, Senior Seismic Hazard Analysis Committee (SSHAC) work, etc., as well as any newer information or research.

3. Evaluate the existing data utilizing independent subject matter experts and a SSHAC Level 1 process.

4. Evaluate any updated hazard information (from the above process) for potential significance and impact on seismic risk. This evaluation would use the NRC's Process for Ongoing Assessment of Natural Hazard Information (POANHI) as guidance.

5. If needed, perform updated seismic hazard calculations.

6. Prepare a seismic update report, which should fulfill the SB846 requirement (targeted for completion in the fourth quarter 2023, depending on review results).

The FFT inquired about the scope of the work discussed above and was informed that DCPP intended to build on its last comprehensive seismic hazard update which was the SSHAC Level 3 study completed in 2015 (Reference 6.14.2). Currently, DCPP did not believe that there was any significant new information that would warrant a major reevaluation. The FFT also inquired regarding the threshold that would be used to determine the significance of any new information on the seismic hazard at DCPP, and the staff responded that the Seismic Probabilistic Risk Assessment (Reference 6.14.3) would be the primary guidance in helping to evaluate the significance of new information. In this manner, the threshold for evaluating seismic safety can be based on a quantitative assessment of risk and not on any discrete regulatory standards.

Conclusions: DCPP's plan to perform an updated seismic assessment to respond to a requirement in Senate Bill 846 appeared appropriate. The DICSC should review the updated seismic assessment when completed.

Recommendations: None.

3.15 Self-Assessment Program

The DCISC FFT met in-person with Matt Birkel, Performance Improvement (PI) Manager, for an update on DCPP's Self-Assessment Program. The DCISC last reviewed the Self-Assessment Program in August 2020 (Reference 6.15.1) when it concluded the following:

> *DCPP's Self-Assessment Program continues to be an active and effective program for evaluating and improving station performance. Following the identification that several recurring Self-Assessments had not been completed within the periodicity required by station procedures, appropriate corrective actions were initiated.*

The DCPP Self-Assessment Program is controlled by Procedure OM15. ID4, "Self-Assessment and Benchmarking," Revision 17, dated April 28, 2022, a copy of which was provided to and reviewed by the FFT. This procedure describes the various station responsibilities for performing, reviewing, reporting and approving the various types of Self-Assessments to insure consistency in their execution and conduct. It outlines the process and requirements for all types of Self-Assessments, especially formal Self-Assessments. The program includes three general types of self-assessments:

1. Formal Self-Assessment – an evaluation of a particular program, process, system or potential problem area using a structured methodology involving scheduling, planning, one or more industry peers, a team of DCPP personnel, training, documentation in written reports and Notifications, and report-outs to management.

2. Quick Hit Self-Assessment (QHSA) – a narrow, snapshot look at a specific program, process, or issue, usually of a one- or two-day duration and not requiring industry peer involvement or report out to management.

3. Benchmarking – a study to identify industry excellence or best practices in an external organization. Compares findings at other organizations to DCPP in order to identify gaps and develop recommendations for improvement. The DCISC separately reviewed DCPP's Benchmarking programs during its March 2022 Fact-Finding Meeting (Reference 6.15.2).

Mr. Birkel reported that the Self-Assessment Program had recently been provided with more visibility and support from station leadership. This support often came in the form of Self-Assessments that were being initiated and performed as a part of Departmental Excellence Plans. He reported to the FFT that DCPP performed the following total numbers of Self-Assessments during 2022:

- 7 Formal Self-Assessments
- 29 Quick Hit Self Assessments

The FFT reviewed formal Self-Assessment and QHSA reports provided regularly to the DCISC and found that Self-Assessments performed in 2022 included the following functional areas:

- Chemistry
- Cyber Security
- Engineering
- Industry Benchmark Initiatives
- Performance Improvement
- Procedures Management
- Radiation Protection
- Reactivity Management
- Risk Management
- Safety
- Security

- Seismic
- Spent Fuel Management
- Learning Services
- Turbine-Generator Contractor Management

In general, both types of assessments were found to be well performed with follow-up actions for improvements clearly identified and tracked. Some examples of assessments (other than security-related) that the DCISC reviewed and found satisfactory in the last three months prior to this meeting were:

- Formal Self-Assessment for Industry Initiative “Finishing on Top” (SAPN 51135994)

- Formal Self-Assessment for Problem Identification and Resolution (SAPN 51139860)

- Formal Self-Assessment for the Engineering Training Program (SAPN 51107568)

- QHSA for the Inservice Inspection Program (SAPN 51166041)

- QHSA for the Administrative Procedures Work Group (SAPN 51088928)

- QHSA for the Operations Procedure Work Group (SAPN 51089944)

- QHSA for the Dry [Spent] Fuel Management Program (SAPN 51100639)

- QHSA for Reactor Engineering (SAPN 51143271)

Regarding evaluations by external organizations, the NRC performed an inspection of the DCPP Problem Identification and Resolution Program in December 2022, and the industry benchmark organization reviewed the program in mid-2022. Both organizations concluded that the program was effective.

Mr. Birkel also provided the FFT a copy of his department’s excellence plan and briefly reviewed its contents. The FFT inquired with Mr. Birkel about staffing within the PI group and he responded that there were currently seven PI Coordinators and one supervisor in the group. With the possibility of extended operations, he was planning to hire an additional two PI Coordinators and one additional supervisor.

Conclusions: DCPP’s Self-Assessment Program continues to be an active and effective program for evaluating and improving station performance.

Recommendations: None.

3.16 Motor-Operated Valve Program

The DCISC FFT met in-person with Chad Sorenson, Motor-Operated Valve (MOV) Program Owner, for an update on the status of the MOV Program at DCPP. The DCISC last reviewed the MOV and Air-Operated Valve programs together in December 2020 (Reference 6.16) when it concluded the following:

> *The DCPP Air- and Motor-Operated Valve Programs appear to be sound and to be implemented satisfactorily.*

DCPP's MOV Program was controlled by Procedure MA1.ID1, "Motor-Operated Valve (MOV) Program Plan," Revision 13, dated December 21, 2021, a copy of which was provided to and reviewed by the FFT. Additionally, there were several other procedures that govern MOV setpoints, MOV testing, and the trending of MOV testing data. Mr. Sorenson described DCPP's program as a mature program based on industry guidance documents including NRC Generic Letters 89-10 and 96-05. The purpose of the program is to test and maintain MOVs that are safety-related or important to accident mitigation such that they will properly function if required to do so during an accident. The program was developed in the mid-1990s as part of an industry effort in response to NRC concerns about the operability of MOVs. An industry Joint Owners' Group (JOG) was also formed in the late 1990s and DCPP personnel participate in the JOG.

There are 155 valves included in the MOV Program at DCPP. For each valve, a design basis reconstitution has been performed to determine operational parameters, which are used as the basis for test acceptance criteria. Additionally, valve capability and operator sizing calculations are performed to assure that the valve/operator combination is acceptable for its specific application. Baseline, periodic, pre-overhaul, and post-maintenance testing are performed on each MOV. Periodic testing is typically done every third outage (four to five years) with 20-25 valves being tested each outage. Records and trends are maintained, and any problems are documented and tracked in the Corrective Action Program. Mr. Sorenson stated that during a refueling outage, about six Notifications were typically written for minor issues such as making setpoint adjustments to meet administrative limits. Mr. Sorenson reported that no MOVs had failed to perform their functions during testing within the last five years.

The FFT was provided with a copy of the MOV Program Health Report. The program was rated as "White" (Healthy but Needing Improvement) due primarily to staffing challenges which did not provide for a fully trained and designated backup to the MOV Program Owner. Mr. Sorenson reported that his group was planning to add staff and recently had made two offers to experienced engineers. Additionally, recent issues with excessive packing leakage on valve RHR-2-8702 resulted in delays in exiting Refueling Outage 2R23. The FFT was also provided with a copy of the most recent program Self-Assessment report dated May 10, 2021. The report was comprehensive and identified seven deficiencies, three gaps, and one enhancement for which notifications were written to ensure future action.

Conclusions: The DCPP Motor-Operated Valve Program appeared to be an active and effective program to ensure that Motor-Operated Valves important to safety would function properly if needed during an accident.

<u>Recommendations</u>: None.

4.0 CONCLUSIONS

4.1 DCPP plans to meet the SB846 requirement for a study by independent consultants to catalog and evaluate any deferred maintenance at DCPP through obtaining the services of an independent entity to review the results of its PMO++ initiative. The DCISC concluded that this approach appeared appropriate, and the DCISC should review the results of the study following its completion.

4.2 DCPP continues to review capital projects that will be needed to support extended operations through 2030. The DCISC should review the results of this review following its completion.

4.3 The meeting with the NRC Senior Resident Inspector was beneficial, and the DCISC should continue the meetings.

4.4 The performance of DCPP's Engineering Department has recently been strong, and the Department is appropriately moving to expand staffing in light of the recent decision to extend operations. The DCISC should review department staffing and performance again in about one year.

4.5 Orano, DCPP's proposed vendor for future spent fuel storage services, provided technical information in response to a list of detailed questions from the DCISC. Based on the information provided, the DCISC's questions were satisfactorily addressed, and the system appeared to be adequately designed to assure safety. The DCISC will continue to monitor license amendment progress and other work to incorporate the system at DCPP. The DCISC should review the site-specific seismic evaluation after final reviews and approvals are completed and other future technical issues on as they arise.

4.6 The DCISC found that the Auxiliary Saltwater Systems continue to be given close attention by the DCPP staff, and the systems in both Units continue to be rated as "Healthy" with no major issues. The DCISC believed that using available funds to have a vendor update calculations on allowable ocean inlet temperatures would be appropriate given the possibility of extended operations and the challenge of rising ocean water temperatures.

4.7 DCPP's Turbine and Generator Systems were in good overall health. Replacements of both units' High Pressure Turbines and/or Voltage Regulators could be needed to support improved reliability for extended operations.

4.8 DCPP's Cyber Security System and Program appear effective in preventing external malware attacks on plant safety and power-producing systems.

4.9 The Fact-Finding Team learned that a single FLEX Strategy was currently incorporated into DCPP's Probabilistic Risk Assessment and concluded that this appeared appropriate. The Fact-Finding Team recommends that additional Fact-Finding Meetings be scheduled to cover any remaining DCISC questions or issues raised by this review.

4.10 The DCISC Fact-Finding Team toured the FLEX equipment storage area in the Fire Department Building. All FLEX equipment appeared to be in good condition and was properly restrained to reduce the likelihood of damage during a seismic event.

4.11 DCPP's plan to conduct Plant Health Committee meeting on February 1, 2023, was cancelled for an appropriate reason.

4.12 The regular meetings between DCISC Members and DCPP Officers and Directors continue to be beneficial for both organizations

4.13 DCPP properly evaluated and responded to evidence of a minute Reactor Coolant System leak discovered while shutdown for Refueling Outage 2R21. Personnel implementing DCPP's Boric Acid Corrosion Control Program performed well in identifying the leak location during routine inspections. The DCISC should review the results of the associated Root Cause Evaluation after its completion.

4.14 DCPP's plan to perform an updated seismic assessment to respond to a requirement in Senate Bill 846 appeared appropriate. The DICSC should review the updated seismic assessment when completed.

4.15 DCPP's Self-Assessment Program continues to be an active and effective program for evaluating and improving station performance

4.16 The DCPP Motor-Operated Valve Program appeared to be an active and effective program to ensure that Motor-Operated Valves important to safety would function properly if needed during an accident.

5.0 RECOMMENDATIONS

5.1 None.

6.0 REFERENCES

6.1 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023,"

Approved September 13, 2023, Volume II, Exhibit D.6, Section 3.4, "Revised Capital Plan."

6.2 "Diablo Canyon Independent Safety Committee Thirty-second Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2021 – June 30, 2022", Approved September 28, 2022, Volume II, Exhibit D.9, Section 3.10, "Capital Plan Review."

6.3 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023," Approved September 13, 2023, Volume II, Exhibit D.6, Section 3.1, "Meet with NRC Resident Inspector and NRC PI&R Inspection Team."

6.4 "Diablo Canyon Independent Safety Committee Thirty-Second Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2021 – June 30, 2022," Approved October 19, 2022, Volume II, Exhibit D.7, Section 3.6, "Strategic Engineering Department Update."

6.5.1 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023," Approved September 13, 2023, Volume II, Exhibit D.5, 3.10, "Technical Review of New Spent Fuel Storage System."

6.5.2 "NUHOMS EOS System Updated Final Safety Analysis Report," Revision 4, June 2022, NRC ADAMS Accession Numbers ML22168A023 and ML22168A024.

6.5.3 "CoC 1042, Amendment 2, Revision 7, Appendix A, NUHOMS EOS System Generic Technical Specifications," September 2021, NRC ADAMS Accession Number ML21244A298.

6.6.1 "Diablo Canyon Independent Safety Committee Thirtieth Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2019 – June 30, 2020," Approved September 30, 2020, Exhibit D.7, Section 3.4, "Auxiliary Saltwater System."

6.6.2 "Diablo Canyon Independent Safety Committee Thirty-Second Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2021 – June 30, 2022," Approved October 19, 2022, Volume II, Exhibit D.3, Section 3.5, "Cause Evaluation for Failed Auxiliary Saltwater Pump Motor."

6.7.1 "Diablo Canyon Independent Safety Committee Thirty-First Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2020 – June 30, 2021," Approved October 20, 2021, Volume II, Exhibit D.5, Section 3.9, "Turbine-Generator Health."

6.7.2 "Diablo Canyon Independent Safety Committee Thirty-Second Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2021 – June 30, 2022," Approved October 19, 2022, Volume II, Exhibit D.3, Section 3.8, "Root Cause Evaluation for Unit 2 Main Generator Failures."

6.7.3 Ibid, Exhibit B.3, "Minutes of October 19-20, 2021 Public Meeting."

6.8 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023," Approved September 13, 2023, Volume II, Exhibit D.3, 3.7, "Cyber Security Update."

6.9.1 "Diablo Canyon Independent Safety Committee Thirty-Second Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2021 – June 30, 2022," Approved October 19, 2022, Volume II, Exhibit D.8, Section 3.2, "FLEX Program Update."

6.9.2 "Seismic Probabilistic Risk Assessment for the Diablo Canyon Power Plant. Units 1 and 2 - Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1: Seismic of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," submitted to the US Nuclear Regulatory Commission as an attachment to PG&E letter DCL-18-027, April 24, 2018, NRC ADAMS Accession Number ML18120A201.

6.9.3 "Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications," by A. D. Swain and H. E. Guttmann, US Nuclear Regulatory Commission, Report NUREG/CR-1278, August 1983, NRC ADAMS Accession Number ML20085K326.

6.10 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023," Approved September 13, 2023, Volume II, Exhibit D.5, Section 3.7, "Plant Tour."

6.11 Ibid, Exhibit D.6, Section 3.5, "Long Term Seismic Program Update."

6.12 Ibid, Exhibit D.6, Section 3.10, "Meet with Site Vice-President, Adam Peck, and Industry Benchmark Results."

6.13.1 Unit 2 Licensee Event Report 2022-01-00, submitted to the Nuclear Regulatory Commission as an attachment to PG&E letter DCL-22-093, "Unit 2 Reactor Coolant System Pressure Boundary Degradation," December 12, 2022, NRC ADAMS Accession Number ML22355A081.

6.13.2 "Diablo Canyon Independent Safety Committee Thirty-First Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2020 – June 30, 2021," Approved October 20, 2021, Volume II, Exhibit D.8, Section 3.7, "Boric Acid Corrosion Control Program."

6.14.1 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023," Approved September 13, 2023, Volume II, Exhibit D.5, Section 3.4, "Comprehensive Review of the Seismic Safety Program."

6.14.2 "Seismic Hazard Screening Report, Diablo Canyon Power Plant Units 1 and 2," submitted to the Nuclear Regulatory Commission as an attachment to PG&E letter DCL-15-035, "Response to NRC Request for Information pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident; Seismic Hazard and Screening Report," March 11, 2015, NRC ADAMS Accession Numbers ML15070A607 and ML15070A608.

6.14.3 "Seismic Probabilistic Risk Assessment for the Diablo Canyon Power Plant. Units 1 and 2 - Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1: Seismic of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," submitted to the US Nuclear Regulatory Commission as an attachment to PG&E letter DCL-18-027, April 24, 2018, NRC ADAMS Accession Number ML18120A201.

6.15.1 "Diablo Canyon Independent Safety Committee Thirty-First Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2020 – June 30, 2021," Approved October 20, 2021, Volume II, Exhibit D.2, Section 3.12, "Self-Assessment Program."

6.15.2 "Diablo Canyon Independent Safety Committee Thirty-Second Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2021 – June 30, 2022," Approved October 19, 2022, Volume II, Exhibit D.7, Section 3.9, "Benchmarking Program."

6.16 "Diablo Canyon Independent Safety Committee Thirty-First Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2020 – June 30, 2021," Approved October 20, 2021, Volume II, Exhibit D.5, Section 3.2, "Motor- and Air-Operated Valve Testing during Refueling Outage 1R22."